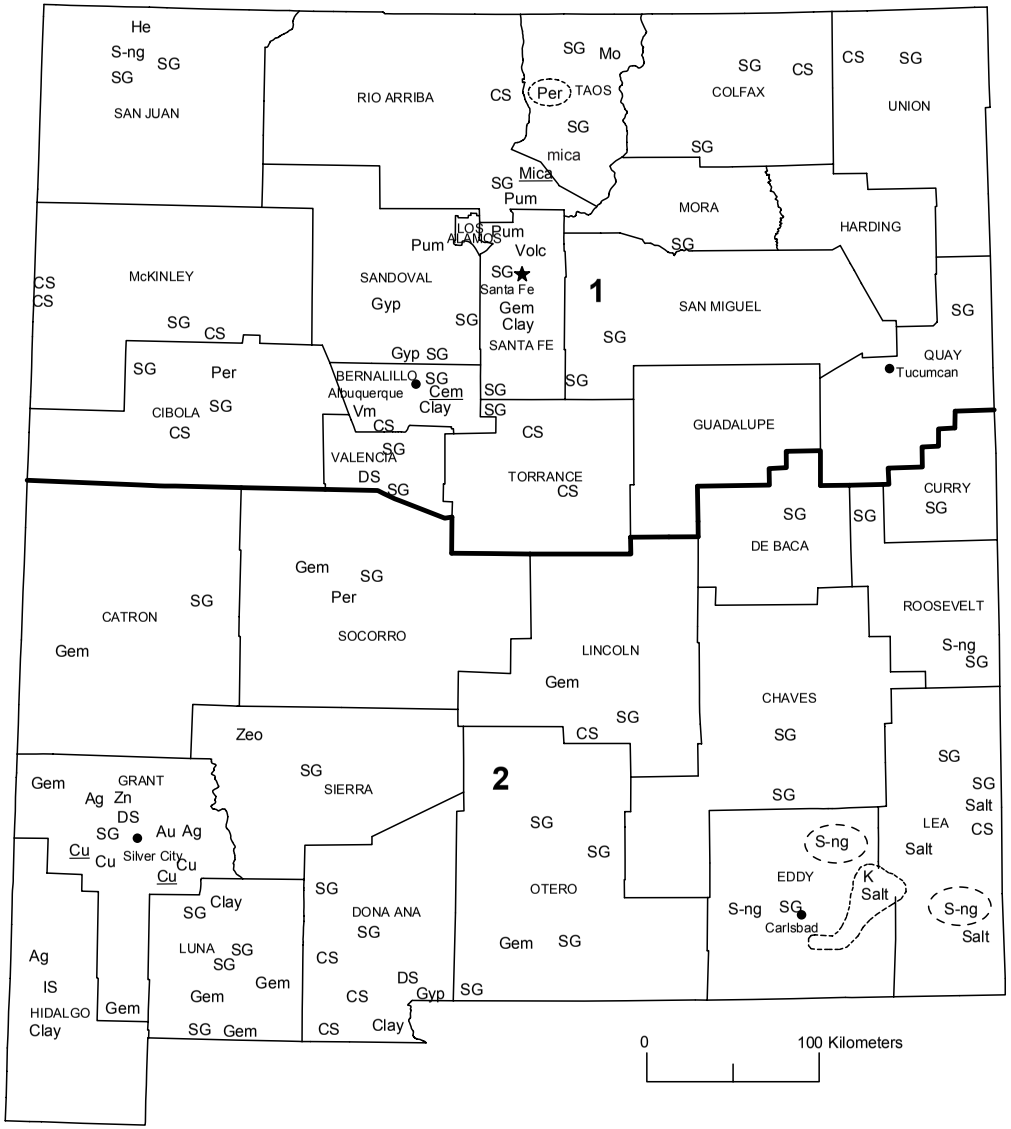
NEW MEXICO



LEGEND

- County boundary
- Capital
- City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Au	Gold
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
DS	Dimension stone
Gem	Gemstones
Gyp	Gypsum
He	Helium
IS	Industrial sand
K	Potash
Mica	Mica
Mica	Mica plant
Mo	Molybdenum
Per	Perlite
Pum	Pumice
S-ng	Sulfur (natural gas)
Salt	Salt
SG	Construction sand and gravel
Vm	Vermiculite
Volc	Volcanic cinder
Zeo	Zeolites
Zn	Zinc
	Concentration of mineral operations

Source: New Mexico Bureau of Mines and Mineral Resources/U.S. Geological Survey (2002)

THE MINERAL INDUSTRY OF NEW MEXICO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Mexico Bureau of Mines and Mineral Resources for collecting information on all nonfuel minerals.

In 2002, the estimated value[1] of nonfuel mineral production for New Mexico was $574 million, based upon preliminary U.S. Geological Survey (USGS) data. This was nearly a 4% decrease from that of 2001[2] and followed a 24% decrease from 2000 to 2001. The State was 25th in rank (23d in 2001) among the 50 States in total nonfuel mineral production value and accounted for about 1.5% of the U.S. total.

The top nonfuel minerals in New Mexico were, by value, potash and copper, followed by construction sand and gravel, crushed stone, and cement (portland and masonry). These five accounted for about 91% of the State's total nonfuel raw mineral production value. Potash returned to being the State's leading nonfuel mineral; for 33 of the past 34 years (from 1968 through 2001) copper led; potash (reported as potassium salts prior to 1990) was the leading nonfuel mineral in the early 1950s through 1967 and in 1982. In 2002, copper production and value decreased as it had in 2001 owing to lower average copper prices and the continued scaling back of some operations and the closure of others. In 2002, the decrease in copper of $52 million accounted for the largest portion of the State's decrease in value, more than one-half of which was offset by increases in molybdenum concentrates and crushed stone, up about $11 million each, and potash, up about $8 million. Smaller yet significant increases also occurred in construction sand and gravel and gypsum (descending order of change) (table 1).

In 2001, decreases in the values of copper, down $141 million, potash, down about $27 million, and construction sand and gravel, down about $12 million, accounted for the largest portion of the State's decrease in value. Smaller yet significant decreases also occurred in mica, down $6 million, and in cement, gold, perlite, and gypsum (descending order of change), ranging from a $4 million decrease to a $2 million decrease. The value of molybdenum concentrates was up by about $5 million, crushed stone rose by nearly $4 million, salt increased by more than $3 million, and pumice was up by $1 million (table 1).

Based upon USGS estimates of the quantities of minerals produced in the 50 States during 2002, New Mexico was first in the Nation in potash, perlite, and zeolites, third in copper and mica, and fifth in molybdenum. The State was third in pumice and pumicite (second in 2001) and was a significant producer of construction sand and gravel, gypsum, and dimension stone (descending order of value).

The following narrative information was provided by the New Mexico Bureau of Mines and Mineral Resources[3] (BMMR). Production data in the text that follows are those reported by the BMMR and are based on the agency's own surveys and estimates. They may differ from some production figures reported to the USGS.

Commodity Review

Industrial Minerals

Aggregates.—Total State aggregate production was lower in 2002 than 2001 because of less road construction. Residential use has increased as a result of lower mortgage rates. Lafarge Corp. sold 4.8 million metric tons (Mt) of aggregates in 2002 that accounted for 35% of the total aggregate production in New Mexico.

Clay.—Two types of clay are mined in New Mexico—common and fire clay. Common clay is used for making bricks, quarry tile, and roofing granules. Commercial adobe yards in northern New Mexico produce adobe bricks from local alluvial materials. Fire clay is quarried from Luna and Grant Counties for use in the copper smelter.

Gemstones.—Gemstones and semiprecious stones produced in New Mexico include agate, azurite, fluorite, geodes, moonstone, onyx, peridot, smithsonite, and turquoise. Production statistics for 1998-2002 are withheld for gemstones and semiprecious stones.

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[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2002 USGS mineral production data published in this chapter are preliminary estimates as of July 2003 and are expected to change. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Specialist contact information may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html; alternatively, specialists' names and telephone numbers may be obtained by calling USGS information at (703) 648-4000 or by calling the USGS Earth Science Information Center at 1-888-ASK-USGS (275-8747). All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2001 may differ from the Minerals Yearbook, Area Reports: Domestic 2001, Volume II, owing to the revision of preliminary 2001 to final 2001 data. Data for 2002 are preliminary and are expected to change; related rankings may also change.

[3]Virginia T. McLemore, Senior Economic Geologist, authored the State mineral industry information provided by the New Mexico Bureau of Mines and Mineral Resources.

Most of the commercial mines have closed because of the depletion of known deposits and the difficulty and expense of adhering to Federal, State, and local environmental regulations.

Mica..—Mica is used as functional filler in building materials because of its unique physical characteristics, including color, flexibility, durability, thermal properties, and weight. It is used in the manufacture of numerous industrial and consumer products such as joint compound, paints, automotive sound deadening materials, thermoplastics, coatings, and even cosmetics.

Only one mine, the U.S. Hill Mine (owned by Oglebay Norton Co.) in Taos County, produced mica in 2002, and it was the largest producer of muscovite mica in the United States. Mica is produced from a muscovite quartz schist of Proterozoic age. Reserves were estimated as exceeding 3.6 Mt (enough to last for 49 years). The mine was the 4th largest scrap-mica mine in the United States and covered approximately 6 hectares (ha). A mine expansion planned in 2001 would increase the size of the mine to 36 ha within 20 years. The nearby Picuris Pueblo (Native Americans) opposed the expansion.

Perlite.—Perlite is weathered (hydrated) natural glass that is formed by the rapid cooling of viscous, high-silica rhyolite lava. It is used in building construction products, horticultural aggregate, filter aid, fillers, and other uses. Production from three mines in New Mexico was lower in 2002 because of less building construction in the United States.

Potash and Salt.—The Carlsbad potash district is the largest potash-producing area in the United States. Mississippi Potash, Inc. (a subsidiary of Mississippi Chemical Corp.) and IMC Kalium Potash Mines (a subsidiary of IMC Global Inc.) operated mines in the district. Potash is used as fertilizer and as a chemical in specialty and industrial markets. Mining is by underground methods. The estimated potash reserves in the district amount to more than 502 Mt. Sodium chloride, salt, also is produced locally as a byproduct. It is used in oilfield drilling, in animal feed, and to deice roads.

IMC Kalium's reserves were estimated to be 137 Mt of potash ore in three mining beds at thickness ranging from 1.4 meters (m) to more than 3 m. These ore reserves were estimated to yield 8.1 Mt of concentrate from sylvinite with an average grade of 60% potassium oxide (K2O) and 27.6 Mt of langbeinite concentrate with an average grade of approximately 22% K2O. These reserves are expected to last 15 to 23 years. Total production in 2002 was almost 1.8 Mt of finished product (IMC Global Inc., 2003§[4]).

Mississippi Potash, Inc. (formerly New Mexico Potash Corp. and Eddy Potash, Inc.) owns two facilities at Carlsbad, the East Mine and the West Mine. The estimated total reserves as of 2002 were 519 Mt with an average grade of 15.2% K2O. The recoverable reserves were estimated to be 460 Mt at a grade of 14.7% K2O (Mississippi Chemical Corp., 2003§). In fiscal 2002, Mississippi Chemical Corp. produced approximately 814,000 metric tons (t) of potash and sold approximately 827,000 t, primarily in granular form. Net sales of potash products by Mississippi Chemical Corp. in fiscal 2002 were approximately $77.5 million, which represented approximately 17% of consolidated net sales. The West Facility, which consists of a potash mine and refinery, has an annual production capacity of approximately 488,000 t of red potash. The East Facility, which has an annual production capacity of approximately 508,000 t of white potash, consists of a potash mine, refinery, and compaction plant. On August 29, 2002, the company elected to reduce the production rate at the East Facility to match market conditions, resulting in a reduction in workforce of 47. On December 3, 1997, Mississippi Chemical Corp. suspended mine and refinery operations at Eddy Potash, Inc. because the depletion of the higher grade ore zone rendered the continued operation of conventional mining methods uneconomical. Mississippi Chemical Corp. continued to evaluate alternative mining methods for the Eddy Potash reserves. Two types of ore were processed. Flotation was used to produce red potash and hot leach crystallization was used to produce the higher purity white potash.

Pumice.—Pumice was found in the Jemez Mountains and the Mogollon-Datil volcanic field. Six operations were active in New Mexico in 2002.

Zeolites.—Zeolites were found disseminated in altered volcanic ash, and clinoptilolite was the predominant mineral with unique physical, chemical, and cation exchange properties for uses in agricultural, environmental, and industrial applications. Markets included odor control and hygiene products (cat litter), industrial fillers and absorbents, filtration media, environmental products, animal feed supplements, soil conditioners, floor-drying agents, mineral fillers, water and wastewater treatment, air filtration media, and cation exchanged products.

St. Cloud Mining Co. (a subsidiary of Imagin Minerals, Inc.) operated the largest zeolite mine in the United States at the Stone House Mine in Sierra County. Imagin Minerals, Inc. bought the St. Cloud Mining Co. from the Goldfield Corp. in December 2002. The company has operated the open pit mine since 1993. The mining properties consisted of approximately 600 ha and contained 16.6 Mt of reserves. Clinoptilolite was mined, crushed, dried, and sized without beneficiation and shipped packaged to meet customer's specifications. In 2001, St. Cloud produced 14,500 t of natural zeolite. St. Cloud Mining Co. also has made several modifications to its zeolite operation, including the addition of cation exchange capacity for added value products and additional classification capabilities to expand markets for its products. The modern facility has the crushing and sizing capacity of 450 metric tons per day.

Other Industrial Minerals.—Helium was produced from the Shiprock and Ute Dome fields in the San Juan Basin. Helium was used in cryogenic applications, welding cover gas, pressurizing and purging, controlled atmospheres, leak detection, gas mixtures, and other uses.

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[4]References with a section mark (§) are found in the Internet References Cited section.

Humates were weathered coal or highly organic mudstone that were found in the coal-bearing sequences. New Mexico has significant concentration of humates, predominantly in the Fruitland and Menefee Formations in the eastern San Juan Basin. Humate was produced from five mines in New Mexico. Humate was used as a soil conditioner and as an additive to drilling muds.

Iron ore as magnetite was shipped from the magnetite tailings at Phelps Dodge's Cobre Mine in Grant County and was used by cement plants for clinker manufacture.

Metals

Copper.—Copper prices continued to drop in 2002 and resulted in layoffs, cutbacks, and mine closures. Copper domestic producer cathode averaged $0.88 per pound in 2000, $0.77 per pound in 2001, and $0.76 per pound in 2002 (Edelstein, 2003).

The largest porphyry copper deposit in New Mexico was Phelps Dodge's Chino Mine at Santa Rita. Copper sulfides were found in the upper, fractured granodiorite and adjacent sedimentary rocks. Adjacent copper skarns became increasingly more important economically. In January 2002, the Chino Mine and Hurley smelter were temporarily closed; the heap leach-and solvent solution extraction-electrowinning process (SX/EW) plant remained in operation. In 2002, Phelps Dodge produced 48,800 t of copper by SX/EW (Phelps Dodge Corp., 2003§). Estimated milling reserves in 2002 were 170 Mt of 0.62% copper and 0.02% molybdenum, and estimated leaching reserves were 239 Mt of 0.42% copper (Phelps Dodge Corp., 2003§). Phelps Dodge owned 66.7% of the reserves at Chino.

The Tyrone porphyry copper deposit in the Burro Mountains is hosted in a quartz monzonite laccolith and adjacent Proterozoic rocks. Several ore bodies, sometimes considered separate porphyry copper deposits, have been found. The concentrator processed approximately 270 Mt of ore grading 0.81% copper from 1969 to 1992. The mill closed, and the mine began mining for leach. In 2002, leaching reserves (recoverable copper) were estimated as 204 Mt of ore grading 0.32% copper (Phelps Dodge Corp., 2003§). In addition, the Niagara deposit contains 450 Mt of mineralized material grading 0.29% copper as of December 2000. This mineralized material could be brought into production if market conditions warrant. Copper production by SX/EW in 2002 amounted to 63,400 t of copper (Phelps Dodge Corp., 2003§).

Molybdenum.—Molybdenum was produced from Molycorp Inc.'s Questa Mine in Taos County and as a byproduct of copper smelting in Grant County. Molybdenum is a refractory metallic element used principally as an alloying agent in steel, cast iron, and superalloys to enhance hardness, strength, toughness, and wear and corrosion resistance. Molybdenum also was used in fire retardants and in catalysts. The mineral molybdenite was used as a lubricant. On June 3, 2002, the New Mexico Mining and Minerals Division approved a closeout plan permit for the Questa Mine.

Underground block caving of ore commenced in 1983 and continued into 2002. Average ore grade ranges between 0.3% and 0.5% molybdenum. Molycorp (a subsidiary of Unocal Corp.) processed 787,000 t of crude ore in 2002 and recovered 1,737 t of molybdenum disulfide (MoS_2) in concentrate.

Uranium.—Uranium was used as a fuel for nuclear reactors and has limited industrial applications as a heavy metal. Only one company in New Mexico, Quivira Mining Co. (owned by Bulletin BHP), produced uranium from 1998-2002 from waters recovered from inactive underground operations at Ambrosia Lake. Quivira Mining Co. was no longer producing uranium, and the Ambrosia Lake mill and mines will be reclaimed by 2006. Mine water recovery ceased in 1992 because of a decline in the price of uranium, but resumed in 1994 and then ceased again in 2002. New Mexico ranked second in uranium reserves in the United States.

Reference Cited

Edelstein, D.L., 2003, Copper: U.S. Geological Survey Mineral Commodity Summaries 2003, p. 56-57.

Internet References Cited

IMC Global, Inc., 2003, Form 10K, accessed on March 31, 2003, at URL http://www.IMCGlobal.com/investor/10k-10Q/imc10k2002.pdf.
Mississippi Chemical Corp., 2003, Form 10K, accessed on March 31, 2003, at URL http://www.misschem.com/scrReports/2002_10k.pdf.
Phelps Dodge Corp., 2003, Form 10K, accessed on April 28, 2003, at URL http://www.sec.gov/Archives/edgar/data/78066/000095015303000701/p67450e10vk.htm#014.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN NEW MEXICO[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2000		2001		2002[p]	
		Quantity	Value	Quantity	Value	Quantity	Value
Clays, common		34	256	35	205	30	135
Copper[3]		195	380,000	141	239,000	113	187,000
Gemstones		NA	27	NA	33	NA	33
Sand and gravel, construction		13,400	66,800	10,600	54,500	10,900	57,400
Stone:							
Crushed		3,690	22,400	4,230	26,100	5,900	37,100
Dimension	metric tons	W	W	36,100	1,320	26,100	240
Zeolites	do.	(4)	NA	(4)	NA	--	--
Combined values of cement, gold (2000-01), gypsum (crude), iron ore (usable), lime, mica (crude), molybdenum concentrates, perlite (crude), potash, pumice and pumicite, salt, sand and gravel (industrial), silver (2000-01), and values indicated by symbol W		XX	317,000	XX	276,000	XX	293,000
Total		XX	786,000	XX	597,000	XX	574,000

[p]Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.
-- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

[4]Value excluded to avoid disclosing company proprietary data.

TABLE 2

NEW MEXICO: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2000				2001			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	17	2,200	$9,320	$4.25	16	2,240	$9,690	$4.32
Granite	2	W	W	10.08	2	W	W	9.66
Sandstone	1	W	W	9.72	--	--	--	--
Volcanic cinder and scoria	7	W	W	12.12	7	W	W	11.60
Miscellaneous stone	15	637	3,830	6.01	9	968	5,920	6.11
Total or average	XX	3,690	22,400	6.07	XX	4,230	26,100	6.17

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2001, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	28	$162	$5.79
Filter stone	W	W	3.86
Other coarse aggregates	18	63	3.50
Total or average	46	225	4.96
Coarse aggregate, graded:			
Concrete aggregate, coarse	213	1,350	6.32
Bituminous aggregate, coarse	78	732	9.38
Bituminous surface-treatment aggregate	W	W	10.54
Railroad ballast	W	W	10.80
Other graded coarse aggregates	800	6,320	7.90
Total or average	1,090	8,400	7.70
Fine aggregate (-3/8 inch):			
Stone sand, concrete	162	798	4.93
Stone sand, bituminous mix or seal	(2)	(2)	3.64
Screening, undesignated	(2)	(2)	7.19
Coarse and fine aggregates:			
Graded road base or subbase	246	1,030	4.20
Terrazzo and exposed aggregate	(2)	(2)	25.82
Crusher run or fill or waste	(2)	(2)	4.17
Roofing granules	(2)	(2)	6.66
Other construction materials	199	1,110	5.58
Unspecified:[3]			
Reported	1,180	6,540	5.55
Estimated	1,200	5,100	4.41
Total or average	2,330	11,600	4.99
Grand total or average	4,230	26,100	6.17

W Withheld to avoid disclosing company proprietary data; included with "Other."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Grand total."

[3]Reported and estimated production without a breakdown by end use.

TABLE 4
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2001,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified discticts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1 1/2 inch)[2]	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	W	W	--	--
Fine aggregate (-3/8 inch)[4]	W	W	W	W	--	--
Coarse and fine aggregate[5]	W	W	W	W	--	--
Other construction materials	13	95	186	1,020	--	--
Unspecified:[6]						
Reported	95	568	365	1,620	718	4,350
Estimated	850	3,800	310	1,300	--	--
Total	2,280	15,800	1,230	5,940	718	4,350

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, and stone sand (concrete).

[5]Includes crusher run (select material or fill), graded road base or subbase, roofing granules, and terrazzo and exposed aggregate.

[6]Reported and estimated production without a breakdown by end use.

TABLE 5
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2001,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregates (including concrete sand)	1,950	$12,900	$6.62
Plaster and gunite sands	221	1,260	5.68
Concrete products (blocks, bricks, pipe, decorative, etc.)	308	1,480	4.79
Asphalt concrete aggregates and other bituminous mixtures	858	5,580	6.50
Road base and coverings[2]	1,520	6,890	4.55
Fill	356	1,020	2.85
Other miscellaneous uses	20	112	5.60
Unspecified:[3]			
Reported	1,830	7,170	3.91
Estimated	3,500	18,000	5.20
Total or average	10,600	54,500	5.17

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement).
[3]Reported and estimated production without a breakdown by end use.

TABLE 6
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2001,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	1,560	10,700	391	2,240	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	442	2,300	87	430	--	--
Asphaltic concrete aggregates and other bituminous mixtures	830	5,320	28	255	--	--
Road base and coverings[3]	864	3,570	652	3,320	--	--
Fill	137	470	220	544	--	--
Other miscellaneous uses	8	54	12	58	--	--
Unspecified:[4]						
Reported	1,690	6,870	114	250	29	49
Estimated	1,400	8,500	2,100	9,600	--	--
Total	6,970	37,800	3,560	16,700	29	49

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement).

[4]Reported and estimated production without a breakdown by end use.